Cenozoic.—A unique siluroid fish from the London clay of Sheppey has been figured and described by A. Smith Woodward. From the character of the fossil its precise affinities cannot be determined, but it closely approaches the living Auchenoglanis of the African rivers. König's name of *Bucklandium diluvii* has been retained (Proc. London Zool. Soc., 1889).——Mr. L. C. Hicks has been studying the lagoons of Custer county, Nebraska, and reaches the conclusion that they are the result of sedimentation upon a surface previously shaped by the action of the winds. In other words, the lagoon type is a combination of the sedimentary and æolian types of conformation (Bull. Geol. Soc. Am., Vol. II., p. 25).——In a discussion of the Glacial epoch, F. Leveret presents a line of evidence in support of the theory of two distinct epochs. This evidence is based upon the character of the buried soil and leached till of ten moraines in Illinois, Indiana, and Ohio. The amount of oxidation and leaching would require the lapse of a long interval of time; that is, an epoch of deglaciation in the midst of the Glacial period (Proc. Boston Soc. Nat. Hist., Vol. XXIV., 1889).——According to L. C. Johnston, the flood of muddy waters from the Nita crevasse in the Mississippi River has seriously affected the marine life in the Mississippi Sound. Oyster plantings have been destroyed, and many valuable food fishes have been driven out (Bull. Geol. Soc. Am., Vol. II., p. 20).

ZOOLOGY.

Function of Gemmiform Pedicellariæ of Echinoids.[1]—H. Prouho contributes a very interesting observation to the very vexed question of the functions of pedicellariæ. If a specimen of *Strongylocentrotus lividus* or *Sphærechinus granulatus* be placed in a vessel in which there are one or more specimens of *Asterias glacialis* which have been compelled to fast for some time, the Echinoid will be immediately attacked by the starfishes. As soon as it feels the touch of their ambulacral tubes, it rapidly withdraws its spines from the part threatened; the spines bend out from the center of attack to so great an angle that they become almost tangential to the test. In thus removing its spines the urchin unmasks its gemmiform pedicellariæ, which are then stretched towards the arms of the starfish with the jaws

[1] *Comptes Rendus*, CXI., p. 62, 1890. Abstract from *Jour. Roy. Micros. Socy.*, Oct., 1890, p. 611.

wildly open. The starfish continues its attack, but as soon as one of the pedicellariæ touches an ambulacral tube it immediately bites it; we may suppose that the pain produced is considerable, for the arm of the starfish is actively withdrawn, but it always carries with it the offending pedicellaria fixed in the wound.

In some cases the first bites are sufficient to drive off the starfish, but in others it prolongs the attack, and then it is very interesting to see the urchin unmask its pedicellariæ on the points attacked, and, so to speak, follow the movements of the enemy by showing its teeth. In a first fight the victory is always with the urchin, and the starfish retires covered with wounds. But, as each pedicellaria serves only once for the defense of the urchin, it is gradually deprived of its organs for this purpose. If an urchin is put with several starfishes and abandoned to its fate it succumbs at last.

The moment an Echinoid is warned by its peripheral nervous system of the danger which threatens it, it moves its spines in a way which has nothing in common with the ordinary movements of these organs, and which has no other object than to unmask its gemmiform pedicellariæ. It is of interest to observe that this movement is exactly the opposite of that which is produced when the surface of the test is wounded by, for example, the point of a needle; in that case the spines and pedicellariæ are inclined towards the wounded part.

Hekaterobranchus is the name given by Miss F. Buchanan [2] to a Spionid worm discovered at the mouth of the Thames; but in a postscript she thinks it may belong to Webster's genus Streblospio. The characters are a single pair of dorsal branchiæ situated on the first segment; cephalic tentacles, not grooved but ciliated all over; prostomium well developed; four eyes; first segment prolonged below to form a collar; pharynx evertible and richly ciliated; a single pair of thoracic nephridia, opening on second segment, reaching back to sixth segment, and thence bending forward again.

The Anatomy of Scutigera.—Curt Herbst has discovered some interesting facts regarding this Myriapod. In his Dissertation [3] he describes five systems of glands in the head where he only expected to find the salivary gland described by Dufone. The first is a pair of tubular glands opening at the base of the first maxillæ. The second pair belong principally to the segment of the second maxillæ and open in a deep pit on the side of the head. The third system belongs to the

[2] *Quarterly Jour. Micros. Sci.*, XXXII., p. 175, 1890.

[3] Anatomische Untersuchungen an Scutigera Coleoptrata. Jena, 1890.

same segment and has its openings at the base of the second maxillæ. The fourth and fifth systems are very similar in structure, but differ in the position of their ducts. The fourth opens just behind the second system, the fifth goes through the body wall immediately behind the commissure uniting the dorsal and supraneural vessels. The histology and structure of these systems are detailed. Regarding the functions of these glands Herbst has but little to offer. He thinks that some of them (possibly System III.) may act as spinning glands; while others may play a part in preparing food material. A discussion of the homology of these glands with the head glands of Hexapods and the coxal glands of other Arthropods follows, but our knowledge of these is not sufficient to lead to sure results, though the author considers them as homologous with the coxal glands.

The circulatory apparatus is also described, the most interesting features pointed out being the existence of a cardiac nerve, arising probably from the sympathetic; and the comparison of the supraneural vessel and the arteries on either side of the œsophagus with the similar organs in the Annelids.

The Balancers of Diptera.—Ernst Weinland presents a long and detailed account [4] of his studies of the balancers or halteres in twenty genera of flies. The position, color, hairs, relations, the chitinous skeleton, internal structure, canals, terminal vescicle, nerves and nerve-end structures are described at great length and illustrated by five plates. The results may be summarized in a few words. The balancers are to be regarded as extremely modified wings with internal canals corresponding to those in the "veins" or "nervures" of the true wings. They have not yet lost their powers of motion, a hinge remaining at the base, and in accordance with their position the direction of the flight of the fly is changed. The sense organs with which they are clothed must be regarded as organs of equilibrium.

Nerves of Tortoise Shell.—J. B. Haycraft has noticed the sensitiveness of the carapace of the land tortoise (*Testudo græca*) of Southern Europe. He finds that nerve-fibres penetrate the osseous portion of the carapace and enter a connective-tissue layer immediately beneath the scutes. In this latter they lose their undulated character, and become covered with a dense sheath of tissue. With suitable preparations these nerves are seen to branch, and the ultimate fibres can be traced to the nuclei of the epidermal cells. Not all cells are thus innervated, nor were any nerves found within the shell itself.

[4] *Zeitsch. f. wiss. Zoologie*, LI., p. 55, 1890.

The Cannon-Bone of Ruminants.—The usually accepted view has been that the cannon-bone of the hind leg of the ruminants consists of the coalesced metatarsals three and four, and that the metatarsals two and five become lost during development. J. E. V. Boas now offers evidence[5] which goes far to show that in these forms we are to recognize besides the coalesced metatarsalia three and four the upper ends of metatarsalia two and five. His views are thus in correspondence with those arrived at by various authors in the fossil forms.

EMBRYOLOGY.[1]

Embryology of Limulus.—Professor J. S. Kingsley publishes a preliminary note on the "Ontogeny of Limulus."[2] The segmentation nucleus undergoes several divisions before any signs of segmentation of the egg are seen at the surface. The resulting nuclei migrate towards the surface, and forty hours after impregnation the egg itself begins to cleave, so that the whole becomes separated into cells, with a nucleus in each segment, and a blastoderm forms on one side of the egg. Here the cells are smaller, forming a primitive cumulus, comparable to that of spiders. A circular spot appears in the center of the cumulus, becomes triangular, elongates, and forms a shallow groove,—the blastopore. The mesoderm forms along its margins. Later six pairs of segmentally arranged sensory thickenings appear outside the legs. The first pair gives rise in the median ocelli, the second to a new sense organ, the third disappears, the fourth remains as the "dorsal organ," the fifth gives rise to the paired compound eyes, the sixth is evanescent. All of these organs are connected by a longitudinal nerve. The facts obtained from the ontogeny point to a close relationship between Arachnids and Limulus.

Embryology of Phalangium.—A preliminary note on the early stages of Phalangium is published by Victor Faussek.[3] The egg breaks up into a solid mass of cells, each filled with yolk, and each containing a nucleus. From the large, superficial cells there separates by *delamination* small cells, while the resulting small cells form the blastoderm, which soon appears on one side of the egg. The large

[5] *Morph. Jahrbuch.*, XVI., p. 526, 1890.

[1] Edited by Dr. T. H. Morgan, Johns Hopkins University, Baltimore, Md.

[2] *Zoologisches Anzeiger*, No. 345, 1890.

[3] *Zool. Anz.*, January, 1891, No. 353.